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TARIFFS FOR WATER SUPPLY SERVICES FOR IRRIGATION AS A TOOL FOR ATTRACTING INVESTMENTS TO IMPROVE WATER USE AND AMELIORATIVE INFRASTRUCTURE

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Abstract. *Conceptual approaches to increasing the investment attractiveness in water resources and land reclamation infrastructure should be adapted to solving the problems facing states and societies, including measures to ensure sustainable economic development and environmental protection. The implementation of investment and infrastructure projects is provided for by the Irrigation and Drainage Development Strategy until 2030 and is becoming relevant in solving the problems of the Ukrainian economy. Implementing a tariff policy will allow for maintaining land reclamation infrastructure in working condition, reducing the energy intensity of water supply for irrigation, establishing technological integrity of water use, etc. Such tasks draw attention to increasing the function of tariffs as one of the sources of covering investments in water infrastructure. A general trend in solving problems can be considered a broad view of problems, lower risk, and higher management reliability.*

The article critically analyzes the experience of using irrigated lands based on the introduction of tariffs, given the investment component of tariffs and the use of mobilized funds for investment activities. Productive and inefficient principles of tariff formation are shown, and the importance of land reclamation infrastructure and current directions of financing irrigation infrastructure in EU countries are revealed through compliance with the requirement of targeted funds spending for infrastructure facilities.

Based on the risk classification, the significance and impact of risks in the operation of land reclamation systems in market conditions are given; the main components of tariff formation in irrigation water supply services, which include investments in improving land reclamation infrastructure, are outlined; contents of the investment component in the activities of water user organizations (WUO) is indicated, and the ways for the return on investment in land reclamation infrastructure in Ukraine are outlined. Ukraine's experience in successfully using the irrigation potential through a tariff policy for water supply can serve as an example for other countries.

Keywords: *irrigation, investments, land reclamation infrastructure, tariffs*

Relevance of the study. Reforming the irrigation industry through a system of tariffs and financing the development of the agrosphere will allow increasing the economic efficiency of irrigation, ensuring its financial sustainability and fiscal transparency [1], the functioning and renewal of irrigation and drainage systems, which is provided for by the tasks of the “Strategy of Irrigation and Drainage in Ukraine up to 2030” [2]. The state and problems of the development and participation of the Ukrainian Water Users Organizations in attracting investments are shown [3]. Tariff formation in irrigation water supply is considered as a means of maintaining irrigation systems in proper condition and a source of formation of capital investments in the restoration and modernization of the land reclamation infrastructure of Ukraine.

Purpose of the study The purpose of the study is to determine the main components of tariff formation for irrigation water supply services as a tool for reliable financial support and stimulation of efficient water use by water users of Ukraine, based on the analysis of regulatory acts, the practice of forming and attracting investments in land reclamation infrastructure, and risk assessment.

Analysis of recent research and publications The researchers emphasized the importance of irrigation in Ukraine depending on the cost of water and the importance of introducing a transparent tariff system for water supply and wastewater services [4], considered significant aspects of the role of investments and tariffs [1–3, 6, 7, 16, 22, 23, 28, 35–37], summarized and systematized scientific approaches to

methods for forming tariffs for irrigation water supply and compensation for funds spent on water supply in EU member states [5]. There is a methodology for calculating the effectiveness of methods and regimes of crop irrigation [6] where applied principles of economic assessment of investments in drip irrigation projects on a modern basis are given. The research results on the trends of loading in the irrigation sector when solving sustainable development problems [7] were considered, including both cautious opinions [33] and positive ideas about investments in the tariff system [28, 31, 32]. Functions, legal principles, and mechanisms of tariffs in world practice were shown, and the problems of reforming the water management system on reclaimed lands were addressed [25]. However, there was no study on tariff formation aspects in Ukraine when supplying water for irrigation with investment in land reclamation infrastructure based on the experience of the EU and other countries.

Research methods The following methods were used in the research: historical-logical (the experience of European countries in providing paid services for maintenance of land reclamation systems based on introducing tariffs and investments in land reclamation infrastructure was studied), logical-abstract (regulatory acts, literary sources, and the best practices from 2000 to 2024 were analyzed), analytical-synthetic (processing of the information received and summarizing the results in the form of tables on tariff schemes in water supply services, the role of risks in infrastructure investment, revealing the high potential for return on investment in constructing modern irrigation systems in Ukraine; using the positive activities of the WUO), systemic analysis regarding the study of the experience of EU countries on water tariffs and mobilizing investments in land reclamation infrastructure in Ukraine.

Research results and their discussion

The importance of the chain: water resources → reclamation infrastructure → investments. Based on the complex and multidisciplinary nature of reclamation systems, attracting investments to the construction/renewal of such systems based on improving water supply services is recognized as an important component of a water use management mechanism in irrigated agriculture. The sense of the investment attractiveness of projects for the efficient use of resources is the presence of transparent political, institutional, environmental, macroeconomic, and business factors that, through risk reduction, contribute to the attraction of financial resources

to the irrigation sector and guarantee the return on invested funds.

In Ukraine, the reclamation system is considered as a technologically integrated engineering infrastructure; the powers of the central executive body implementing the state policy in the field of hydrotechnical land reclamation include: participation in the implementation of investment policy, placement of state investments under target programs [8]; attraction of investments and investment attractiveness of irrigation and drainage systems are provided for by the “Strategy for the Development of Irrigation and Drainage in Ukraine for the Period Until 2030” [2], the need to attract investments in the modernization and restoration of state pumping stations, in the formation of a favorable investment climate [9] is also specified, the financial relationships of the categories: tariffs, infrastructure and investments [1] are gaining importance, the close connection between them is noted by the Rules of Ecological and Economic Accounting [10]; the need to take into account the risks associated with climate change is indicated [1], the economic efficiency of investment projects is assessed according to known market indicators: payback period, internal rate of return, profitability index, net discounted income, etc. [6, 11].

Research has identified several market approaches that can affect the economic attractiveness of investments in irrigation infrastructure. They include subsidizing infrastructure, clearly defining water rights, facilitating market-based water transfers, and marginal cost-based irrigation water pricing [12]. However, implementing the specified business approaches is not linear/directive and has its peculiarities when solving the problem of fund returning funds invested in land reclamation in different countries.

According to the analysis published by BofA (Bank of America), there is a growing interest in water as an investment object in the world, although the actual volumes of investment are still far from potential needs. This is confirmed by the investment amount in achieving the Sustainable Development Goals (SDGs) related to water. Thus, achieving SDG 6 “Ensuring water access and sanitation for all” requires an annual investment of 114 billion dollars [7], and achieving SDG 14 “Conservation and rational use of ocean and sea resources” will be possible with an annual investment of 175 billion dollars. Unfortunately, from 2015 to 2019, only \$10 billion was invested in achieving SDG 14.

One of the reasons for the insufficient investment in water is the lack of clear

mechanisms for using tariffs as a tool for attracting investments in water use projects [1]. Therefore, the further reform of the system of water management and land reclamation in Ukraine, carried out to fulfill the tasks of the “Strategy of irrigation and drainage in Ukraine until 2030” [2] and the Plan of measures for its implementation [9], requires development and implementation in practice the methods of forming tariffs for water supply/removal services in irrigation and drainage as tools for attracting investments in the implementation of projects to increase irrigation and drainage areas [1, 2].

Therefore, it is appropriate to consider the existing approaches to forming tariffs for water supply from the point of view of accumulating funds for investments in reclamation infrastructure as a component of tariffs (Table 1.)

It should be noted that of the 9 options in Table 1, only the first 6 methods of determining water price and water management services meet the requirements of the modern economy, as they provide incentives for rational water use, allow the accumulation of funds for the restoration and modernization of the reclamation infrastructure, and contribute to investments and investment returns. The last 3 should be assessed as unproductive in the conditions of a market economy since they rely on financing current and

capital costs from the budget. In practice, a tariff system for water supply services may be flexible depending on the state/forecasts of natural water supply (very wet, moderately wet, or dry year). The condition for cost coverage at the expense of tariffs and investments borne by the contractor for providing services is stipulated by the EU Directive on the conclusion of concession contracts [14].

Concept and current trends of irrigation infrastructure financing in the EU. According to the Commission on Technical Guidance regarding the protection infrastructure against climate change in the period 2021-2027 [15], infrastructure is a rather broad concept that includes, in particular, natural infrastructures, such as green roofs, walls, spatial objects, and drainage systems; network infrastructure, which is crucial for the functioning of the modern economy and society, in particular water supply and wastewater use. Infrastructure investments must be aligned with the goals of the Paris Climate Agreement to reduce greenhouse gas emissions in line with the EU’s climate goals up to 2030, climate neutrality up to 2050, and climate-resilient development. In addition, it is noted that investments in infrastructure projects should not cause significant damage to other EU environmental goals, such as sustainable use

1. Options of tariff formation for irrigation water supply

Main feature	Content
Cost principle	It involves all costs for the operation of the infrastructure and a part of investment costs
Benefit principle	The procedure for determining the cost of water management services based on increasing the profit of recipients of water management services
Marginal principle [12]	It is based on the price of water and water management services that will cover the system costs in the long term, while optimizing the productive use of the system and maximizing the formation of additional value of crop irrigation
Block tariff method	It applies block pricing, so that the area charge includes the provision of e.g. 2,000 m ³ /hectare, and all water supplied above this incurs the full volumetric charge. [1]. Since under this method the water price changes gradually depending on its consumption, it is aimed at reducing water consumption.
Method of water pricing in off-peak and peak periods	It involves a change in the price depending on the period of water withdrawal from the system, and is typical for crop irrigation in arid areas, very similar to the marginal principle.
Method of price “discrimination”	It is based on the maximization of the price that the user is ready and willing to pay; the price is determined depending on the user’s ability and willingness to pay a certain price.
Socio-political method	It leads to irrational consumption of water resources due to the lack of productivity stimulation.
Equal price method (flat rate tariffs)	It is not directly connected with the quantitative characteristics of water supply.
Method of “shadow” pricing	It represents the “protection” of social values and seeks to bring the price of water to the social optimum.

Source: created by the authors according to [13]

and protection of water and marine resources, transition to a closed-loop economy, prevention and recycling of wastes, the prevention and control of pollution and the implementation of the ecosystem protection of people's health.

The report of the Audit Chamber of the EU (European Court of Auditors) emphasizes the high importance of targeted spending of funds for land reclamation infrastructure. It is noted that during a systematic study of spending funds for the sustainable use of water in the agricultural sector of the European Union, based on state audit methods, it was established that the irrigation infrastructure, which increases the quantity and improves the quality of water, belongs to the key consumers of these funds. Therefore, the possibility of building new irrigation infrastructure and its improvement is being considered, namely new irrigation installations, water intake infrastructure, wastewater treatment infrastructure for water reuse in irrigation, "green" infrastructure for water conservation; capital expenditures and depreciation deductions from the value of infrastructure facilities, as a component of the costs of water management organizations, provision and administration of water supply services, etc.

The already mentioned Report of the EU Audit Chamber states that various forms of EU financing are available to investment entities to implement irrigation projects, namely EU rural development programs that support the funding of water conservation measures, increasing irrigated areas and establishing wastewater treatment infrastructure for reusing water in irrigation. Certain investments require potential water savings of more than 5 %, and it is problematic to ensure that irrigation investments will benefit water bodies, especially if the irrigated area is within a water-stress area.

When constructing a new irrigation infrastructure, confirmation of land ownership and/or a valid water withdrawal permit is required. Within the framework of the "Common Market Organization" (CMO), irrigation infrastructure is financed for three sectors: fruits and vegetables, olives and olive oil and wine. Modernization of existing systems is practiced, besides the olive and olive oil sector, where EU can support only improvements. Irrigation infrastructure may be financed under other programs such as "Production Planning". In general, the state financial audit showed that rural development programs do not sufficiently support water conservation measures and water reuse infrastructure [16].

Many years of experience in introducing

paid water use, tariffs, and investments in the Republic of Kyrgyzstan [19] are valuable. The main components of this area in Kyrgyzstan are: establishing fairly high tariffs, establishing tariffs mainly for the irrigated area due to the lack of hydrometric posts on watersheds, introducing the mechanism of flexible regulation of tariff rates, establishing a preferential tariff for electricity for irrigation pumping stations, introducing an effective mechanism for controlling and accounting for water use and supervising of unauthorized water intake from natural water bodies, uninterrupted financing of WUO activities and ensuring timely payment for irrigation services, establishing a fee for irrigation water supply services as mandatory, regulating the mechanisms of responsibility of the primary division of Water Resources Service of Kyrgyzstan and water users for fulfilling contractual obligations regarding the supply of irrigation water, introducing developed mechanisms for ensuring transparency and targeted use of investments in the irrigation sector from the state budget and water users' funds.

An essential element of managing complex reclamation systems in market conditions is the consideration of risks, that is, the danger of uncertainty and failure to get the planned result. Considering the risk factor enables us to choose a risk reduction strategy and achieve the set goals. There are operational risks (can arise during current business activities) and financial risks (related to changes in financial markets, as well as credit and investment risks), short-term (may have an impact on the business activities shortly), and long-term risks (may have a significant impact on business activities in the distant perspective), etc. The risk assessment of irrigation investment projects is regularly considered [6]. The practical development of the permit system, including databases and a risk-based verification system, is envisaged [1]. The significance of the risk factor associated with infrastructure investments for better water use through irrigation tariffs is presented in Table 2.

To overcome macroeconomic risks, management decisions should be based on a clear understanding of the hydrological cycle and reasonable water accounting [23]. So there is a need for a detailed assessment of risks and potential problems, a careful analysis of the costs of functioning and support of water user associations, and the introduction of financial management, investment planning, and risk management [24].

Given the formation of an effective economic mechanism for ensuring the functioning of the

2. Investment risks in water supply infrastructure

Type of risk	Specifications and examples
Macroeconomic and business risks	<p>Investment risk:</p> <ul style="list-style-type: none"> • possible adverse impact on the expected investment income due to disruption of the stability in project implementation; • state guarantees in project implementation. <p>State support for irrigation based on water supply tariffs:</p> <ul style="list-style-type: none"> • determining the amount of state subsidies for expenses • adjustment of the taxation system, <p>Operational and construction risk: risks associated with complex technologies and innovative approaches.</p> <p>Market risk:</p> <ul style="list-style-type: none"> • ensuring uninterrupted financing of WUO activities, water users, and water supply operators; • changes in demand for water supply services. <p>Political risk:</p> <ul style="list-style-type: none"> • in case of public procurement (for example, growing cotton and tobacco); • in case of political interference in the process of tariff imposing. <p>Risk of funds transfer: in case of discrepancy between the income from the water supply by accounting and the receiving funds from debtors.</p> <p>Credit risk: in case a counterparty fails to fulfill his contractual agreements.</p> <p>Risk of agreement termination in time: the risk of premature termination of long-term contracts.</p>
Regulatory and political risks	<p>Regulatory risks include:</p> <ul style="list-style-type: none"> • changing the principles of tariff formation and improving the tariff policy. Tariffs are imposed depending on the costs of water supplied by irrigation systems, taking into account the type of crops (based on water consumption rates); • economic regulation can be strong, weak, or absent; • provisions on the participation of the private sector in forming and improving infrastructure.
Commercial risks	<p>Industry risks: risks affecting revenues from a specific project (water availability, water accumulation, payment of services by the tariff);</p> <p>Risk of creditors' claims: raising claims for disruption of water supply schedules, low quality of services, violation of environmental protection legislation, and failure to receive the planned yields under irrigation.</p>
Environmental risks	<ul style="list-style-type: none"> • variability in water availability due to climate change may reduce the efficiency of water infrastructure, such as hydropower generation; • potential negative environmental impact of large multipurpose water infrastructure;* • positive impact of using purified wastewater for irrigation; • growing the hazards of depletion and deterioration of water resources.
<p>*multipurpose infrastructure covers all constructed water systems, including dams, reservoirs, hydroelectric power plants, and associated irrigation canals and water supply networks, which can have a multipurpose use in economic, social, and environmental activities [17].</p>	
Social risk	<ul style="list-style-type: none"> • resettlement of households that may be flooded downstream of dams; • limited labor availability associated with tariff increases; • attraction of qualified labor force when expanding irrigated land areas and cultivating crops with high added value; • the positive impact of land reclamation infrastructure on the development of settlements located in reclamation areas [18].

Compiled by the authors according to [6, 17, 18]

reclamation water supply infrastructure for crop irrigation based on water supply tariffs, taking into account regulating investment provision and the impact of investment risks, it is possible to group the basic aspects of tariff formation in water supply services: actual volumes and management of water resources, the essential role of reclamation infrastructure and water management. The factors of attraction and use of investments in infrastructure improvement through introducing tariffs when providing services are shown in the Table 3.

Investing in irrigation infrastructure and mobilizing sources of return. The state, as the initiator of land reclamation activities, takes the necessary measures on attracting financial resources and targeted use of investments, ensure the efficient use of water and renewed land, as well as return the invested funds. In many countries, there is the practice of building new irrigation systems at the expense of state budget funds, external borrowings, bank loans, etc., with the subsequent transfer of infrastructure facilities into ownership/management to independent companies or water user associations [19]. At the same time, it is noted that financial resources and technical support of irrigation infrastructure from state or international donors for infrastructure maintenance and management are less available

than for initial investments. That can lead to poor maintenance and poor-quality service provision [23]. Therefore, efforts to mobilize their own (private) financial resources for renewing infrastructure facilities are justified.

In particular, the modernization of on-farm and inter-farm irrigation systems in Ukraine will require investments of about 3 billion USD and allow for additional irrigation on a total area of about 1,180,000 hectares [2].

There are known proposals to use the investment component in water supply tariffs as a source of investment financing in the form of paid water use mechanisms, along with reducing subsidies to support irrigation from national/local budgets, increasing the financial burden on direct users of water supply services – water users in the agricultural sector, with mandatory consideration of their actual paying capacity [19]. Such measures meet the requirements of the WFD [26] regarding compliance with the principle of water supply cost recovery.

The importance of the investment component in tariffs in Ukraine. It has been established that improving the performance of WUOs in Ukraine will lead to increasing the area fees to cover investment costs, but that will happen at a lower volume fee since the cost of water pumping is reduced about twice. This

3. Main components of tariff formation in irrigation water supply services

Components of tariff formation	Description of the tariff system
Water resources	Availability of water resources, ensuring water supply during the irrigation season, compliance with nature protection requirements, taking measures to save water, and clear water accounting.
Land reclamation infrastructure	Ensuring water supply for selected methods of irrigation, maintenance in working condition, and improvement of reclamation infrastructure at the cost of funds obtained for water supply services according to tariffs; ensuring water transportation by water users' orders, compliance with water supply schedules, and using effective irrigation methods.
Management of water resources	Separation of management functions of water and land reclamation infrastructure and provision of water supply and drainage services from the water management tasks based on decentralization. A promising direction is the transfer of the functions of reclamation infrastructure management and operation to water users' organizations and associations, ensuring the implementation of the investment project program and monitoring compliance with the rules for operating water objects.
Tariff systems for irrigation water supply services	The use of effective principles of tariff formation, covering the costs of infrastructure operation by tariffs, accumulating funds under the investment tariff component, giving priority to the two-rate tariff, stimulating the efficient water use; tariff differentiation depending on irrigation technology, set of crops under irrigation, technical condition of irrigation systems (traditional systems, reconstructed systems, new systems); using the advantages of integrated water management by the basin principle, accounting of costs for supplying water for irrigation (separation of constant and variable costs, application of ecological and economic accounting of water [2]).

problem will probably be actual for a few years until WUOs upgrade all their pumping stations [1] and bring the irrigation area in line with the capacity of the pumping stations. The full amount of all costs associated with water management on the tariff basis will be shown, an effective tariff policy for WUOs water supply services will be developed, the coverage of economically justified costs and a fair distribution of the financial burden on water users through the introduction of two-rate tariffs with fixed and variable components will be ensured.

There is a fair distribution of costs between water users – “who consumes more water – pays more”; sustainable development of land reclamation systems is ensured by including an investment component in the tariffs [27]. Thus, the tariff rate contributes not only to common but also to the expanded renewal of fixed assets of land reclamation systems.

Including the capital costs for the replacement and construction of engineering infrastructure facilities of a reclamation network (Article 20 “Organization Services” of the Law [3]) in the costs of maintaining the reclamation network of the organization means using tariffs as a source of investment in infrastructure improvement. That is a measure to strengthen responsibility for the targeted use of funds accumulated through tariffs. The implementation of the mechanism for decentralizing irrigation management and transferring on-farm systems to long-term use (ownership) will be facilitated by a legislative solution to create an institute of state-owned reclamation infrastructure operators, etc. [28]. In Ukraine, the investment component has already been included in water supply tariffs as part of municipal services as well as the approved investment program for the relevant year [29].

The problem of insufficient investments in the renewal and maintenance of land reclamation infrastructure facilities, the wear and tear of which reaches 70 %, can be solved through a breakthrough tariff policy. That will contribute to eliminating the deficit of natural water supply in more than 2/3 of the territory of Ukraine, reducing the energy intensity of water supply for irrigation, establishing technological integrity of water use, reducing water loss for filtration, and improving the mechanisms of state support for agricultural producers on irrigated lands [30].

The world’s experience in the formation of investment sources. It can be hypothesized that the existing administration system of the agricultural sector and the irrigation system corresponds to the allocated funds for capital costs in land reclamation infrastructure. In the EU

countries, capital subsidies to irrigators dominate [5], but not the compensation for the costs of maintaining land reclamation systems through tariffs, which entails strict control over the targeted use of funds [16]. Along with “market” options for tariff formation, priorities are given to solving social problems (Table 1).

This approach may be justified in countries with strong economies and the capacity to cover investments in land reclamation infrastructure from budget funds. Along with uncompromising views on the “principled” impossibility of water users’ funds participating in covering capital investments in hydro-technical land reclamation, there is no requirement to cover the capital costs associated with these investments. There is no requirement to pay prices compensating for the depreciation costs of “donated” components [33], etc. There are known individual cases of including capital costs in tariffs; for example, in Israel, 40 % of the water tariff is an investment component for water infrastructure development [28]. There are some cost recovery programs under consideration [31]. Regulatory measures and institutional mechanisms (water prices and tariffs) contribute to a stable political environment [32]. There are new initiatives based on water pricing, revision of water rights, water abstraction limits, development of regulated water markets, water reuse, and targeted subsidies for the modernization of irrigation systems. It is noted that water pricing policies would be impossible to implement due to technical and administrative impracticability and the severe social prospect of farmers [34].

The development and implementation of an effective tariff policy for irrigation water supply services, as a component of the state policy of Ukraine in water management, implies the goal of the tariff policy – not to punish water users by increasing the production cost of production, but to increase their interest in efficiency and water saving in water management, increase the participation of the key beneficiaries of irrigation – water users (farmers, households) in implementing effective methods of using reclaimed land and water resources, introduce innovations in irrigated agriculture and irrigation water supply, which in turn will support the full use of irrigation potential.

The attraction of the investments of WUOs is based on tariffs. As of the end of 2023, 33 WUOs have been registered in 10 regions of Ukraine. In 2023 they performed irrigation on an area of 46 thousand hectares, which is 35 % of the total irrigation area in the territory controlled by Ukraine. 7 WUOs submitted information to

the State Land Cadastre about the reclamation network serving their territory, and only one WUO got the right to use the property of the reclamation system. The next step in expanding the activities of WUOs is obtaining the land reclamation network (facilities) in ownership [20]. Therefore, the current state of WUO activities in Ukraine does not yet meet the requirements of the Law of Ukraine “On water user organizations and stimulation of hydrotechnical land reclamation” [3] regarding the use of tariffs to attract investments in irrigation infrastructure.

According to the already mentioned Law on WUOs [3], the legal basis for providing water supply services is precisely “determining the tariff for WUOs’ services”, and this right is the exclusive competence of the general meetings of WUOs [3, Art. 12]. The tariff of the WUOs’ services includes the operating costs of the WUOs’ reclamation network, costs for water intake and delivery to water users, and the WUOs’ organizational costs [3, Article 20]. The participation of WUOs members in introducing investments in the reclamation network of the organization is also regulated [3, Art. 23]. Besides providing services for irrigation water supply, the next step in the WUOs’ activities is introducing a tariff system, which must be coordinated with investments.

Such perspectives are evidenced by the calculations of the economic indicators on irrigation use, which show that the methods of soil water regime operation directly affect the total water consumption in the cultivation technological process, which, in turn, depends on crop type, method of watering, and irrigation regime. The highest profit – from 15.8 to 25.5 thousand UAH/ha was obtained for vegetable crops, and the lowest profit – 5.8 and 6.0 thousand UAH/ha, respectively, for winter wheat and spring barley [6]. High economic efficiency (profit from irrigation is 12 thousand hryvnias/ha) provides financial opportunities for reconstruction and modernization of irrigation with an acceptable (no more than 8-10 years) payback period [4].

In Ukraine, it is believed that the payback period for investments in irrigation when growing commercial corn is 6-8 years [21]. The rules of water statistics provide for the accounting of assets and investments in water supply and drainage infrastructure [10]. When forming restoration plans, and preparing investment proposals and projects in Ukraine, first of all, it is necessary to focus on using available water resources and implementing energy-saving principles [22].

In market conditions, using productive principles of tariff formation becomes a key

moment in the development of irrigation and drainage in Ukraine. Efficient use and conservation of water and good operational condition of reclamation infrastructure give priority to investment objects. To invest funds, an investor, analyst, consultant, financier, or owner need strong arguments to obtain high economic results from the investment project based on the forecasts. Complex multi-purpose infrastructure when implementing the investments, protects water bodies, develops the agrarian sector, and solves social problems. When considering proposals, the main levers of market approaches to investments are used: providing infrastructure processes with financial resources, solving legal problems, and establishing a tariff system [12].

Implementation of investment projects in irrigation based on tariffs provides future benefits. Despite the significant need for funds, projects on the restoration and development of irrigation systems are attractive for investments due to their short payback period [2]. Due to additional irrigation areas that will be under operation after constructing new intra-farm irrigation systems when applying the most modern technical, technological, and constructive solutions, there is a possibility for the construction of irrigation systems with the highest economic efficiency and ecological safety. At the same time, that will make it possible to minimize the cost of irrigation water supply [2]. According to experts, an appropriate water management system should be based on a combination of water policy and management tools accompanied by introducing feasible institutional reforms and necessary investments from the public and private sectors [35].

After decentralization in Indonesia, many sectors require investments from regional governments. The main obstacles to financing infrastructure are insufficient governance and lack of guaranteeing cost recovery through tariffs. To overcome the obstacles tariff payers are involved in these processes [36]. It is appropriate to introduce “smart irrigation”, and involve the state support for innovations, research on improving irrigation productivity, use of alternative sources of water resources for irrigation, and reduction of energy costs in irrigation [37].

Conclusions. As foreign experience shows, the tools of tariffs for water supply services should be used to solve the key financial problem in irrigation development. To solve the problem of restoration of irrigation infrastructure in Ukraine, it will be appropriate to use tariffs for irrigation water services. Such tariffs should have an investment component. The load on the effective mechanism of tariff formation is increasing due

to the mandatory investment component of tariffs and solving administrative and legal problems of further reforming the Ukrainian irrigation and drainage sector.

When applying a two-rate tariff for water supply services for irrigation, capital costs for the replacement and construction (placement) of engineering infrastructure facilities will be covered by the fee for irrigated areas, and the costs of pumping water are included in the variable part of the tariff. An effective tariff policy will affect macroeconomic, regulatory, political, and business risks. Developments and experience of countries with a market economy regarding the attraction of tariffs as a source of investment in reclamation infrastructure, compliance with the target spending funds and solving prospective problems regarding the shortage of water resources, taking into account the impact of risks, introducing paid water use, tariffs and investments are valuable for Ukraine, especially

given the need to deploy the full-fledged activity of the WUOs.

Areas for further research: development of legislation regarding the introduction of tariffs for water supply, the study of the current state of reforms on introducing tariffs, in particular, the practice of the WUOs' activities in the condition of transferring the reclamation network into their ownership, research of the impact of the risk factor on the investment component of tariffs for water supply to minimize the negative impact of risks, generalization of the best practices of reclamation infrastructure operation based on tariffs both in Ukraine and overseas; substantiation of tariff components for irrigated systems in the real conditions of using reclaimed land by agricultural enterprises in Ukraine, determination of indicators (criteria) of tariffs, development of a unified principle (methodology) of calculating tariffs (fees) for the services and implementation technical conditions.

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ТАРИФИ НА ПОСЛУГИ З ПОДАЧІ ВОДИ НА ЗРОШЕННЯ ЯК ІНСТРУМЕНТ ЗАЛУЧЕННЯ ІНВЕСТИЦІЙ ДЛЯ ПОЛІПШЕННЯ ВИКОРИСТАННЯ ВОДИ ТА МЕЛІОРАТИВНОЇ ІНФРАСТРУКТУРИ

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Анотація. Концептуальні підходи до посилення інвестиційної привабливості вкладень у водні ресурси та меліоративну інфраструктуру мають бути адаптовані до розв'язання завдань, що стоять перед державами і суспільством конкретної країни, зокрема заходи, що забезпечують сталий розвиток економіки та природоохоронної діяльності. Реалізація інвестиційних та інфраструктурних проєктів передбачена Стратегією розвитку зрошення та дренажу до 2030 р. і стає актуальною у розв'язанні проблем економіки України. Запровадження політики тарифів дасть змогу підтримувати меліоративну інфраструктуру у робочому стані, знижувати енергоємність подачі води на зрошення, встановити технологічну цілісність водокористування тощо. Такі завдання зумовлюють увагу до підвищення функції тарифів як одного із джерел покриття інвестицій у водну інфраструктуру. Загальною тенденцією у розв'язанні проблем можна вважати широкий погляд на проблеми, менший ризик та вищу надійність управління.

У матеріалі проведено критичний аналіз досвіду використання зрошуваних земель на базі запровадження тарифів через призму інвестиційної складової тарифів та використання мобілізованих коштів для провадження інвестиційної діяльності. Вказано продуктивні та малоефективні принципи формування тарифів, розкрито значення меліоративної інфраструктури й актуальні напрями фінансування інфраструктури зрошення в країнах ЄС через дотримання вимоги цільового витрачання коштів в інфраструктурні об'єкти.

На основі класифікації ризиків наведено значення та вплив ризиків в управлінні меліоративними системами у ринкових умовах; окреслено головні складові тарифоутворення у наданні послуг з подачі води на зрошення, до складу яких входять інвестиції в поліпшення меліоративної інфраструктури; зазначено зміст інвестиційної складової у діяльності організацій водокористувачів (ОВК); накреслено орієнтири окупності вкладень інвестицій у меліоративну інфраструктуру в Україні. Досвід України щодо успішного використання потенціалу зрошення через тарифну політику на подачу води може стати прикладом для інших країн.

Ключові слова: зрошення, інвестиції, меліоративна інфраструктура, тарифи